

## **Appendix C**

### **CHART Assessment for the Upper Willamette River Chinook Salmon ESU**

#### **CHART Participants**

The CHART for this ESU consisted of the following NOAA Fisheries biologists: Ben Meyer (CHART Leader), Michelle Day, Patty Dornbusch, Dan Guy, Lynne Krasnow, Lance Kruzic, Nancy Munn, Mindy Simmons, Cathy Tortorici, and Rich Turner. This CHART assessment also benefitted from review and comments by the Oregon Department of Fish and Wildlife.

#### **ESU Description**

The Upper Willamette River Chinook ESU was listed as a threatened species in 1999 (64 FR 14308; March 24, 1999). The ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon. The agency recently conducted a review to update the ESU's status, taking into account new information and considering the net contribution of artificial propagation efforts in the ESU. We recently published the results of this review and concluded that Upper Willamette River Chinook salmon (including seven hatchery programs) should remain listed as threatened (70 FR 37160; June 28, 2005). The following description is based largely on excerpts from the Willamette/Lower Columbia River Technical Recovery Team's (TRT) recent review of historical population structure for this ESU (Myers et al. 2003).

Historically, the Willamette River basin provided sufficient spawning and rearing habitat for large numbers of spring-run Chinook salmon. The predominant tributaries to the Willamette River that historically supported spring-run Chinook salmon all drain the Cascade Range. The TRT has identified each of these drainages as a historically demographically independent population: Clackamas, Molalla, North Santiam, South Santiam, Calapooia, McKenzie, and Middle Fork Willamette rivers. The TRT also noted that reports of "Chinook salmon in westside tributaries have continued to the present; however it is unlikely the abundance of spawners in any of these tributaries constitutes a [demographically independent population]."

Spring-run Chinook salmon populations in the upper Willamette River basin and Clackamas River have been strongly influenced by extensive hatchery transfers of fish throughout the ESU for nearly 100 years as well as the introduction of fall-run Chinook salmon. Prior to the laddering of Willamette Falls, passage by returning adult salmonids (just upstream of the confluence of the Clackamas and Willamette rivers) was only

possible during winter and spring high-flow periods. Low flows during the summer and autumn months prevented fall-run salmon from accessing the upper Willamette River basin. This isolation has provided the potential for significant local adaptation relative to other Columbia River populations. Also, spring-run fish returning to the upper Willamette River basin historically may have strayed into the Clackamas River when conditions at Willamette Falls prevented upstream passage. Therefore, similarities between Clackamas River and upper Willamette River spring-run fish may reflect an historical/evolutionary association between the two groups.

The early run-timing of adult Willamette River spring-run Chinook salmon relative to other lower Columbia River spring-run populations is viewed as an adaptation to flow conditions at Willamette Falls. Chinook salmon begin appearing in the Lower Willamette River in February, but the majority of the run ascends Willamette Falls in April and May, with a peak in mid May. Currently, the migration of adult spring-run Chinook salmon over Willamette Falls extends into July and August. Historically, passage over the falls may have been marginal in June, due to diminishing flows, and only larger fish would have been able to ascend.

Adults spawn in both mainstem and tributary habitats of eastside drainages to the Willamette River typically from late July to October. The juvenile life-history characteristics of upper Willamette River spring-run salmon appear to be highly variable. Fry emerge from February to March, although sometimes as late as June. Juveniles appear to emigrate continuously out of the tributaries and into the mainstem Willamette River as fry (late winter to early spring), fingerlings (fall to early winter) and yearlings (late winter to spring). Most juveniles enter the ocean as yearlings after overwintering and rearing in the mainstem Willamette and Columbia rivers. In general, the majority of spring Chinook salmon returning to the upper Willamette River basin currently mature at 4 and 5 years old.

### **Recovery Planning Status**

The Willamette/Lower Columbia TRT has identified seven historically demographically independent populations with a single run-type (spring-run fish) and a single ecological spawning zone (the Willamette River) (McElhany et al. 2002). The populations include: Clackamas, Molalla, North Santiam, South Santiam, Calapooia, McKenzie, and Middle Fork Willamette rivers. The TRT also noted that reports of "Chinook salmon in westside tributaries have continued to the present; however it is unlikely the abundance of spawners in any of these tributaries constitutes a [demographically independent population]." Recovery planning will likely emphasize the need for a geographical

distribution of viable populations across the range of the ESU (Ruckelshaus et al. 2002, McElhany et al. 2003). A preliminary draft recovery plan for this ESU is expected by the end of 2005. This plan will be based on the Willamette subbasin plan, which was completed in May 2004. The CHART considered the TRT products in rating each watershed, but did not have the benefit of a recovery plan. We anticipate that, as recovery planning proceeds, we will have better information and may revise our recommendations regarding critical habitat designation.

### **CHART Area Assessments**

The CHART assessment for this ESU addressed 10 subbasins containing 56 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. The Willamette/Lower Columbia Technical Recovery Team (TRT) has identified groups of populations in this recovery planning domain into “strata” intended to assist in evaluating ESU-wide recovery scenarios (McElhany et al. 2002). The strata are based on major life history characteristics (e.g., species run types) and ecological zones. The upper Willamette River Chinook salmon ESU consists of a single stratum due to it being a single run type (spring-run fish) that spawns within a single ecological zone (Willamette River). Recovery planning will likely emphasize the need for a geographical distribution of viable populations across the range of such strata/regions in an ESU (Ruckelshaus et al. 2002, McElhany et al. 2003). Therefore, as part of its assessment the CHART considered the conservation value of each HUC5 in the context of the populations within this stratum. Information is presented below by USGS subbasin because they present a convenient and systematic way to organize the CHART’s watershed assessments for this ESU and their names are generally more recognizable because they typically identify major river systems.

#### **Middle Fork Willamette Subbasin (HUC4# 17090001)**

The Middle Fork Willamette subbasin is the southernmost drainage in the Willamette River Valley and contained in Douglas and Lane counties, Oregon. The subbasin contains 10 watersheds occupied by this ESU and these watersheds encompass approximately 1,367 mi<sup>2</sup> and 1,382 miles of streams. Fish distribution and habitat use data from the Oregon Department of Fish and Wildlife (ODFW) identify approximately 273 miles of occupied riverine habitat in the watersheds (ODFW 2003a,b). Myers et al. (2003) identified one demographically independent population (Middle Fork Willamette River) in this subbasin. These authors also noted that Nicholas (1995) concluded that the native spring-run population was extinct, although some spawning by hatchery-origin fish may occur. The CHART concluded that, despite uncertainties about the origin of the

fish occupying these watersheds today, all of the occupied areas likely contain one or more PCEs for this ESU. Table C1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map C1 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of either high or medium conservation value to the ESU. Of the 10 HUC5s reviewed, four were rated as having high and six were rated as having medium conservation value. The CHART also concluded that the HUC5s with medium overall ratings contained a high value rearing and migration corridor connecting high value upstream watersheds with downstream reaches and the ocean. Table C2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure C1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table C2, the CHART noted that the TRT has classified the Middle Fork Willamette River Chinook salmon as a core population (historically abundant and "may offer the most likely path to recovery") (McElhany et al. 2003).

#### **Coast Fork Willamette Subbasin (HUC4# 17090002)**

The Coast Fork Willamette subbasin is in the upper Willamette River drainage and contained Douglas and Lane counties, Oregon. The subbasin contains four watersheds occupied by this ESU and these watersheds encompass approximately 664 mi<sup>2</sup> and 699 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 44 miles of occupied riverine habitat in the watersheds (ODFW 2003a,b). Myers et al. (2003) did not identify a demographically independent population in this subbasin, and Kostow (1995) characterized them as extinct. Myers et al. (2003) noted that reports of "Chinook salmon in westside tributaries have continued to the present; however it is unlikely the abundance of spawners in any of these tributaries constitutes a [demographically independent population]. Table C1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration reaches, as well as management activities that may affect these reaches in the watersheds. Map C2 depicts the specific areas in this subbasin occupied by the ESU, but is unclear whether all of these areas qualify for consideration as critical habitat for this ESU.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the four occupied HUC5

watersheds in this subbasin were of low conservation value to the ESU. Table C2 summarizes the CHART scores and conservation value ratings, and Figure A1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table C2, the CHART noted that the TRT had not identified a demographically independent population in these watersheds (Myers et al. 2003) as well as the very limited habitat in the subbasin.

### **Upper Willamette Subbasin (HUC4# 17090003)**

The Upper Willamette subbasin contains both eastside and westside drainages as well as the mainstem Willamette River upstream of its confluence with the Santiam River. The subbasin is contained in the following Oregon counties: Benton, Lane, Lincoln, Linn, and Polk. The subbasin contains six watersheds occupied by this ESU and these watersheds encompass approximately 1,872 mi<sup>2</sup> and 2,140 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 225 miles of occupied riverine habitat in the watersheds (ODFW 2003a,b). Myers et al. (2003) identified possibly four demographically independent populations in this subbasin but only one with spawning habitat (Calapooia River). Myers et al. (2003) also noted that reports of “Chinook salmon in westside tributaries have continued to the present; however it is unlikely the abundance of spawners in any of these tributaries constitutes a [demographically independent population].” The CHART concluded that, despite uncertainties about the origin of the fish occupying some of these watersheds today and in light of recent comments from ODFW about the importance of rearing habitats in these areas, the occupied areas likely contain one or more PCEs for this ESU. Table C1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map C3 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of either medium or low conservation value to the ESU. Of the six HUC5s reviewed, three were rated as having low and three were rated as having medium conservation value. These ratings reflect increases (from Low to Medium) in *preliminary* conservation value ratings for the Mary’s and Luckiamute River watersheds as a result of comments provided by ODFW about the importance of some westside tributaries for rearing Chinook salmon. The CHART also concluded that all reaches of the Willamette River within this subbasin (including watersheds with a low overall rating) constitute a high value rearing and migration corridor connecting upstream

populations (e.g., those in the McKenzie, Middle Fork Willamette, and Calapooia Rivers) and high value HUC5s with downstream reaches and the ocean. Table C2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure C1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table C2, the CHART noted that the Calapooia River HUC5 was the only one identified as having spawning habitat for this subbasin as well as the demographically independent population identified therein.

#### **McKenzie River Subbasin (HUC4# 17090004)**

The McKenzie River subbasin is a Cascade Range drainage of the Upper Willamette River and contained in Lane and Linn counties, Oregon. The subbasin contains seven watersheds occupied by this ESU and these watersheds encompass approximately 1,339 mi<sup>2</sup> and 1,251 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 268 miles of occupied riverine habitat in the watersheds (ODFW 2003a,b). Myers et al. (2003) identified one demographically independent population (McKenzie River) in this subbasin. This is probably the only self-sustaining population above Willamette Falls, and possibly in the entire ESU (Myers et al. 2003, NOAA Fisheries 2003). The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table C1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map C4 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of either high or medium conservation value to the ESU. Of the seven HUC5s reviewed, five were rated as having high and two were rated as having medium conservation value. Table C2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure C1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table C2, the CHART noted that the TRT has classified the McKenzie River Chinook salmon as both a core population (historically abundant and "may offer the most likely path to recovery") as well as a genetic legacy population (one of the "the most intact representatives of the genetic character of the ESU") (McElhany et al. 2003). Likewise, ODFW considered the McKenzie River as essential habitat for spring Chinook salmon (ODFW 1993 as cited in Bastasch et al. 2003). Also, occupied reaches in several HUC5s overlap with FEMAT key watersheds for at-risk anadromous salmonids (FEMAT 1994).

### **North Santiam River Subbasin (HUC4# 17090005)**

The North Santiam River subbasin is a Cascade Range drainage of the Upper Willamette River and contained in Clackamas, Linn, and Marion counties, Oregon. The subbasin contains six watersheds, three of which are occupied by this ESU and encompass approximately 315 mi<sup>2</sup> and 340 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 125 miles of occupied riverine habitat in these watersheds (ODFW 2003A,B). Myers et al. (2003) identified one demographically independent population (North Santiam River) in this subbasin. Historically accessible areas in the three uppermost watersheds of this subbasin are now blocked by Big Cliff and Detroit dams. These dams block access to approximately 70% of the historic spawning area in this subbasin (Myers et al. 2003). The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table C1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map C5 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of either high or medium conservation value to the ESU. Of the three HUC5s reviewed, two were rated as having high and one was rated as having medium conservation value. Table C2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure C1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table C2, the CHART noted that the TRT has classified the North Santiam River Chinook salmon as a core population (historically abundant and "may offer the most likely path to recovery") (McElhany et al. 2003). Likewise, ODFW considered the North Santiam River and Little North Santiam River as essential habitat for spring Chinook salmon (ODFW 1993 as cited in Bastasch et al. 2003). Also, occupied reaches in Little North Santiam HUC5 overlap with a FEMAT key watershed for at-risk anadromous salmonids (FEMAT 1994).

The CHART also concluded that the three inaccessible HUC5s (Upper North Santiam, North Fork Breitenbush River, and Detroit Reservoir/Blowout Divide Creek) may be essential to the conservation of the ESU. All three HUC5s are presently occupied by non-listed hatchery Chinook salmon which are trapped downstream and released into these HUC5s. The team determined that the Detroit Reservoir/Blowout Divide Creek HUC5 would have a lower overall conservation value due to the large areas inundated by Detroit Reservoir. The CHART concluded that these unoccupied areas may be essential

because: (1) they once supported a TRT core population; (2) they contain non-inundated habitats that are still relatively abundant and in fair to good condition and improving; (3) there is evidence that the areas can support significant natural production; and (3) the naturally-reproducing population below Big Cliff Dam has limited spawning PCEs and appears to suffer from high mortality rates (Willamette National Forest [WNF] 1994, WNF 1995, WNF 1996, WNF 1997, Ziller et al. 2002, McElhany et al. 2003). The CHART noted that NOAA Fisheries' status review of this ESU stated "the declines in spring Chinook salmon in the Upper Willamette River ESU can be attributed in large part to the extensive habitat blockages caused by dam construction." In addition, the CHART also noted that providing passage at dams and diversions has been identified as a key potential conservation measure for Willamette River salmon and steelhead (Martin et al. 1998, Bastasch et al. 2002). Therefore, the CHART concluded that the ESU would likely benefit if the extant population had access to spawning/rearing habitat upstream and that these areas may warrant consideration as critical habitat.

#### **South Santiam River Subbasin (HUC4# 17090006)**

The South Santiam River subbasin is a Cascade Range drainage of the Upper Willamette River and contained in Linn County, Oregon. The subbasin contains eight watersheds, six of which are occupied by this ESU and encompass approximately 766 mi<sup>2</sup> and 860 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 169 miles of occupied riverine habitat in these watersheds (ODFW 2003A,B). Two watersheds in the upper Middle Santiam River (Quartzville Creek and Middle Santiam River) are blocked by Green Peter Dam. Myers et al. (2003) identified one historically independent population (South Santiam River) in this subbasin. The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table C1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map C6 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of either high or medium conservation value to the ESU. Of the six HUC5s reviewed, three were rated as having high and three were rated as having medium conservation value. Table C2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure C1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in



Table C2, the CHART noted the relatively large amount of potential current habitat (NOAA Fisheries 2003) and the relatively high density of redds observed in recent spawner surveys as compared to other subbasins. (Schroeder et al. 2002 and 2003). While the majority of these spawners were likely of hatchery origin, the CHART believed that these data may be indicative of the availability of abundant spawning PCEs and high production potential in portions of this subbasin.

#### **Middle Willamette River Subbasin (HUC4# 17090007)**

The Middle Willamette River subbasin encompasses most of the valley floor reaches of the Willamette River upstream of Willamette Falls and is contained in the following Oregon counties: Clackamas, Marion, Polk, Yamhill, and Washington. The subbasin consists of four watersheds, all of which are occupied by this ESU and encompass approximately 712 mi<sup>2</sup> and 922 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 158 miles of occupied riverine habitat (all rearing/migration) in these watersheds (ODFW 2003A,B). Myers et al. (2003) identified only a small portion of the spawning range of one demographically independent population (North Santiam River) in this subbasin, although six populations use this subbasin for rearing/migration. The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table C1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map C7 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of low conservation value to the ESU. However, that assessment pertained solely to the tributary streams in these watersheds (e.g., Ash, Rickreall, and Harvey creeks), not the mainstem Willamette River. The CHART concluded that all reaches of the Willamette River within this subbasin constitute a high value rearing and migration corridor. These high value reaches connect nearly all populations and HUC5s in this ESU (except those in the Clackamas River; Myers et al. 2003) with downstream reaches and the ocean. Table C2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure C1 shows the overall distribution of ratings by HUC5 watershed.

### **Yamhill River Subbasin (HUC4# 17090008)**

The Yamhill River subbasin is a Coast Range drainage of the middle Willamette River and is contained primarily in Polk and Yamhill counties, Oregon (with very small and unoccupied portions in Lincoln, Tillamook, and Washington counties as well). The subbasin contains seven watersheds, four of which are occupied by this ESU and encompass approximately 495 mi<sup>2</sup> and 605 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 71 miles of occupied riverine habitat (all rearing/migration) in these watersheds (ODFW 2003Aa,b). Myers et al. (2003) did not identify a demographically independent population in this subbasin. Myers et al. (2003) noted that reports of “Chinook salmon in westside tributaries have continued to the present; however it is unlikely the abundance of spawners in any of these tributaries constitutes a [demographically independent population].” The CHART concluded that, despite uncertainties about the origin of the fish occupying some of these watersheds today and in light of recent comments from ODFW about the importance of rearing habitats in these areas, the occupied areas likely contain one or more PCEs for this ESU. Table C1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration reaches, as well as management activities that may affect these reaches in the watersheds. Map C8 depicts the specific areas in this subbasin occupied by the ESU, but is unclear whether all of these areas qualify for consideration as critical habitat for this ESU.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the four occupied HUC5 watersheds in this subbasin were of low conservation value to the ESU. Table C2 summarizes the CHART scores and conservation value ratings, and Figure A1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table C2, the CHART noted that there were no spawning PCEs in these west-side tributaries and the fact that these watersheds were not identified as part of a historical, demographically independent population (Myers et al. 2003). However, The CHART noted that the lowermost reaches of the Yamhill River watershed (those near the confluence with the Willamette River) may provide important juvenile rearing habitat for eastside Willamette River populations upstream.

### **Molalla/Pudding River Subbasin (HUC4# 17090009)**

The Molalla/Pudding River subbasin is an eastside drainage of the middle Willamette River and contained in Clackamas and Marion counties, Oregon. The subbasin contains six watersheds occupied by this ESU and encompasses approximately 875 mi<sup>2</sup> and 1,057 miles of streams. Fish distribution and habitat use data from ODFW identify

approximately 181 miles of occupied riverine habitat in these watersheds (ODFW 2003a,b). The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table C1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map C9 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of either medium or low conservation value to the ESU. Of the six HUC5s reviewed, three were rated as having medium and three were rated as having low conservation value. The CHART elevated the Abiqua Creek/Pudding River HUC5 from a Low to Medium conservation value, noting that recent data from a watershed assessment indicate that this HUC5 has some of the highest-quality habitat in the Pudding River subbasin (M. Simmons, NOAA Fisheries, pers. com). Table C2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure C1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table C2, the CHART noted that this particular subbasin has relatively low abundance and distribution objectives identified by ODFW for spring Chinook (ODFW 2001 as cited in Bastasch et al. 2002).

#### **Clackamas River Subbasin (HUC4# 17090011)**

The Clackamas River subbasin is a Cascade Range drainage of the lower Willamette River and the only subbasin with spawning habitat for this ESU below Willamette Falls. The subbasin contains six watersheds, all of which are occupied by this ESU and encompass approximately 942 mi<sup>2</sup> and 1,109 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 137 miles of occupied riverine habitat in these watersheds (ODFW 2003A,B). Myers et al. (2003) identified one demographically independent population (Clackamas River) in this subbasin. The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table C1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map C10 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5

watersheds in this subbasin were of either high or low conservation value to the ESU. Of the six HUC5s reviewed, all but one (Eagle Creek HUC5) were rated as having high conservation value. Table C2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure C1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table C2, the CHART noted that the TRT has classified the Clackamas River Chinook salmon as a core population (historically abundant and "may offer the most likely path to recovery") (McElhany et al. 2003). Likewise, ODFW considered the Clackamas River (above North Fork Dam) as essential habitat for spring Chinook salmon (ODFW 1993 as cited in Bastasch et al. 2003). Also, occupied reaches in the uppermost HUC5s overlap with FEMAT key watersheds for at-risk anadromous salmonids (FEMAT 1994).

### **Lower Willamette/Columbia River Corridor**

The lower Willamette/Columbia River rearing and migration corridor consists of that segment from the confluence of the Willamette and Clackamas rivers to the Pacific Ocean. This corridor also includes the Multnomah Channel portion of the Lower Willamette River. Watersheds downstream of the Clackamas River subbasin (Johnson Creek and Columbia Slough/Willamette River HUC5s) are outside the spawning range of this ESU and likely used in a limited way as juvenile rearing habitat for this ESU. Fish distribution and habitat use data from ODFW identify approximately 137 miles of occupied riverine and estuarine habitat in this corridor (ODFW 2003a,b).

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the lower Willamette/Columbia River corridor was of high conservation value to the ESU. The CHART noted that this corridor connects every watershed and population in this ESU with the ocean and is used by rearing/migrating juveniles and migrating adults. The Columbia River estuary is a particularly important area for this ESU as both juveniles and adults make the critical physiological transition between life in freshwater and marine habitats (ISAB 2000, Marriott et al. 2002).

### ***Marine Areas***

NOAA Fisheries' analysis focused on freshwater and estuarine habitats upstream of the mouth of the Columbia River. While marine areas are occupied by this ESU, within this vast area the agency has not identified "specific areas within the geographical area occupied by the species . . . on which are found those physical or biological features . . . essential to the conservation of the species."

### **Comments and New Information Regarding the CHART's Initial Assessments**

The CHART reviewed the public and peer reviewer comments received on the Team's initial findings for this ESU as well as new information relevant to evaluating habitat areas for this ESU. As a result, the CHART changed the conservation value rating for one watershed (Abiqua Creek/Pudding HUC5) within the geographical area occupied by this ESU, but there were no changes to the delineation of occupied habitat areas. The proposed critical habitat designation (69 FR 74572, December 14, 2004) summarizes the comments and responses pertaining to the CHART's initial determinations for this ESU and Tables C1 and C2 reflect the final CHART assessments.

### **References and Sources of Information**

References cited above as well as key reports and data sets reviewed by the CHART include the following:

- Bastasch, R., A. Bibao, and G. Sieglitz. 2002. Draft Willamette Subbasin Summary. Report Prepared for the Northwest Power Planning Council, dated May 17, 2002. (Available at: <http://www.cbfgwa.org/>)
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**Table C1.** Summary of Occupied Areas, PCEs, and Management Activities Affecting PCEs for the Upper Willamette River Chinook Salmon ESU

Map Code	Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Unoccupied but may be essential (mi)**	Management Activities***
				Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*		
	Middle Fork Willamette	Upper Middle Fork Willamette River	1709000101	16.3	5.3	0.3		F
	Middle Fork Willamette	Hills Creek	1709000102	2.5	2.3	0		D, F, R, U
	Middle Fork Willamette	Salt Creek/ Willamette River	1709000103	19	1.6	0		F, R
	Middle Fork Willamette	Salmon Creek	1709000104	2.8	0	0		C, F
	Middle Fork Willamette	Hills Creek Reservoir	1709000105	19.1	24.5	0		D, F
	Middle Fork Willamette	North Fork Of Middle Fork Willamette River	1709000106	37	1.4	0		F, R
	Middle Fork Willamette	Middle Fork Willamette/ Lookout Point	1709000107	20	34.2	0		D, F, R
	Middle Fork Willamette	Little Fall Creek	1709000108	15.5	3.5	0		A, F
	Middle Fork Willamette	Fall Creek	1709000109	24.2	14.1	5.1		A, D, R
	Middle Fork Willamette	Lower Middle Fork Of Willamette River	1709000110	12.5	11.9	0		A, D, F, R, U
	Coast Fork Willamette	Row River	1709000201	0	7.4	0		D, R, U
	Coast Fork Willamette	Mosby Creek	1709000202	11.6	3	0		A, F, R
	Coast Fork Willamette	Upper Coast Fork Willamette River	1709000203	0	2.3	0		D, C, M, R, U
	Coast Fork Willamette	Lower Coast Fork Willamette River	1709000205	0	19.8	0		A, C, D, R, U
	Upper Willamette	Long Tom River	1709000301	0	6.9	0		A, R
	Upper Willamette	Muddy Creek	1709000302	0	80.1	0		A, C, R, U, W
	Upper Willamette	Calapooia River	1709000303	36.4	24.9	0		A, F, R, U
	Upper Willamette	Oak Creek	1709000304	0	34.3	0		A, R, U
	Upper Willamette	Marys River	1709000305	0	29.2	0		A, R, U
	Upper Willamette	Luckiamute River	1709000306	0	13.4	0		A

Map Code	Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Unoccupied but may be essential (mi)**	Management Activities***
				Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*		
	Mckenzie	Upper Mckenzie River	1709000401	21.4	5	0		A, D, F
	Mckenzie	Horse Creek	1709000402	18.7	1.4	0		A, F
	Mckenzie	South Fork Mckenzie River	1709000403	22.5	18.8	0.8		D, F
	Mckenzie	Blue River	1709000404	1.4	0.1	0		D, F
	Mckenzie	Mckenzie River/ Quartz Creek	1709000405	17.1	9.6	0		D, F, R
	Mckenzie	Mohawk River	1709000406	7.4	45.3	4.4		A, F
	Mckenzie	Lower Mckenzie River	1709000407	58.9	33.5	2		A, C, D, F, R, U
	North Santiam	Upper North Santiam River	1709000501	0	0	0	17.3 <sup>a</sup>	
	North Santiam	North Fork Breitenbush River	1709000502	0	0	0	11.1 <sup>a</sup>	
	North Santiam	Detroit Reservoir/ Blow Out Divide Creek	1709000503	0	0	0	10.4 <sup>a</sup>	
	North Santiam	Middle North Santiam River	1709000504	23.5	0.5	0		A, D, F, R
	North Santiam	Little North Santiam River	1709000505	19.5	1.3	0		A, F, M
	North Santiam	Lower North Santiam River	1709000506	37.1	43.5	0		A, D, F, I, S, U
	South Santiam	Hamilton Creek/ South Santiam River	1709000601	16.5	40.7	0		A, C, D, F, I, R, U
	South Santiam	Crabtree Creek	1709000602	15.6	20.6	0		A, C, F, R
	South Santiam	Thomas Creek	1709000603	13.3	23.4	0		A, D, F, R
	South Santiam	Quartzville Creek	1709000604	0	0	0	29.9 <sup>b</sup>	
	South Santiam	Middle Santiam River	1709000605	0	0	0	8.4 <sup>b</sup>	
	South Santiam	South Santiam River	1709000606	11.4	0.1	0		D, F
	South Santiam	South Santiam River/ Foster Reservoir	1709000607	14	4.6	0		D, F
	South Santiam	Wiley Creek	1709000608	8.5	0	0		F
	Middle Willamette	Mill Creek/ Willamette River	1709000701	0	27.4	0		A, C, I, R, U
	Middle Willamette	Rickreall Creek	1709000702	0	38.4	0		A, R, U

Map Code	Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Unoccupied but may be essential (mi)**	Management Activities****
				Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*		
	Middle Willamette	Willamette River/ Chehalem Creek	1709000703	0	70.5	0		A, C, R, U, W
	Middle Willamette	Abernethy Creek	1709000704	0	22	0		A, C, R, U, W
	Yamhill	Lower South Yamhill River	1709000804	0	10.9	0		A, C, R, U
	Yamhill	Salt Creek/ South Yamhill River	1709000805	0	7.9	0		A
	Yamhill	North Yamhill River	1709000806	0	10.7	0		A, U
	Yamhill	Yamhill River	1709000807	0	41.3	0		A, R, U
	Molalla/ Pudding	Abiqua Creek/ Pudding River	1709000901	15.7	21.3	0		A, F, R
	Molalla/ Pudding	Butte Creek/ Pudding River	1709000902	7	36	0		A, F, R
	Molalla/ Pudding	Rock Creek/ Pudding River	1709000903	0	8.5	0		A, I, R
	Molalla/ Pudding	Senecal Creek/ Mill Creek	1709000904	0	17	0		A, U
	Molalla/ Pudding	Upper Molalla River	1709000905	38	0	0		A, F, R
	Molalla/ Pudding	Lower Molalla River	1709000906	4	33.1	0		A, C, F, R, U
	Clackamas	Collawash River	1709001101	16.9	0.2	0		F
	Clackamas	Upper Clackamas River	1709001102	23.7	1.8	0		F
	Clackamas	Oak Grove Fork Clackamas River	1709001103	4	0	0		D, F
	Clackamas	Middle Clackamas River	1709001104	33.9	3.3	0		D, F
	Clackamas	Eagle Creek	1709001105	13.8	3.2	0		A, F, U
	Clackamas	Lower Clackamas River	1709001106	22.9	13.4	0		A, C, D, F, R, S, U
	Lower Willamette	Johnson Creek	1709001201	0	6.4	0		A, C, I, R, U, W
	Lower Willamette	Scappoose Creek	1709001202	0	21.7	0		A, C, F, I, R, U, W
	Lower Willamette	Columbia Slough/ Willamette River	1709001203	0	18.4	0		A, C, R, U, W
	Multiple	Lower Columbia Corridor (Willamette to Ocean)	NA	0	0	98.2 <sup>c</sup>		C, D, I, R, T, U, W

<sup>a</sup> Big Cliff and Detroit dams are a barrier to fish distribution in this watershed. Unoccupied habitat areas above these dams may be essential to conservation.

<sup>b</sup> Green Peter Dam is a barrier to fish distribution in this watershed. Unoccupied habitat areas above these dams may be essential to conservation.

<sup>c</sup> The Lower Columbia River from the ocean upstream approximately 46.5 miles is considered to contain estuarine PCEs, in addition to migration and rearing (ISAB 2000).

\* Some streams classified as “Migration/Presence PCEs” may also include rearing or spawning PCEs, but the GIS data are still undergoing review to confirm additional habitat use types.

\*\* These watersheds contain unoccupied habitat that historically supported spawning and rearing PCEs. The CHART determined that these habitat areas/watersheds may be essential for conservation of the ESU. Since these watersheds are unoccupied, the CHART did not identify management activities.

\*\*\* This list is not exhaustive. It is intended to highlight key management activities affecting PCEs in each watershed. Activities identified are based on the general categories described by Spence et al. (1996) and summarized previously in the “Special Management Considerations or Protection” section of this report. Coding is as follows: F= forestry, G = grazing, A = agriculture, C = channel modifications/diking, R = road building/maintenance, U = urbanization, S = sand and gravel mining, M = mineral mining, D = dams, I = irrigation impoundments and withdrawals, T = river, estuary, and ocean traffic, W = wetland loss/removal, B = beaver removal, X = exotic/invasive species introductions, H = forage fish/species harvest. Primary sources for this information were the CHART and reports by Bastasch et al. (2003), Hulse et al. (2002), Pearson (2003), ODFW (1990a-f, 1992), and land use/land cover GIS layers from the U.S. Geological Survey.

**Table C2.** Summary of Initial CHART Scores and Ratings of Conservation Value for Habitat Areas in HUC5 Watersheds Occupied by the Upper Willamette River Chinook Salmon ESU

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Middle Fork Willamette	Upper Middle Fork Willamette River	1709000101	3	2	1	2	2	10	Moderate-high HUC5 score; PCEs support a TRT core population and may be some of best remaining in subbasin; CHART concluded that uppermost watersheds likely have highest value in this subbasin	High
	Middle Fork Willamette	Hills Creek	1709000102	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core population, but are limited in this HUC5	Medium
	Middle Fork Willamette	Salt Creek/Willamette River	1709000103	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core population; CHART concluded that this and other uppermost watersheds likely have highest value in this subbasin	High
	Middle Fork Willamette	Salmon Creek	1709000104	2	1	1	2	2	8	Moderate HUC5 score; PCEs support a TRT core population, but are very limited in this HUC5	Medium
	Middle Fork Willamette	Hills Creek Reservoir	1709000105	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core population but are more limited due to inundated habitats; high value connectivity reaches for upstream HUC5s	Medium

<sup>1</sup> PCE/watershed scores were derived using the CHART scoring process described in the introduction to this report. The CHART employed an earlier 5-factor version of the scoring matrix for three ESUs (Columbia River chum salmon and Upper Willamette River chinook salmon and steelhead) therefore the maximum possible score for these ESUs was 15 points.

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Middle Fork Willamette	North Fork Of Middle Fork Willamette River	1709000106	3	2	1	2	2	10	Moderate-high HUC5 score; PCEs support a TRT core population population and may be some of best remaining in subbasin; CHART concluded that this and other uppermost watersheds likely have highest value in this subbasin	High
	Middle Fork Willamette	Middle Fork Willamette/Lookout Point	1709000107	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core population population but are more limited due to inundated habitats; high value connectivity reaches for upstream HUC5s	Medium
	Middle Fork Willamette	Little Fall Creek	1709000108	3	1	1	1	2	8	Moderate HUC5 score; PCEs support a TRT core population, but CHART concluded this relatively small HUC5 probably had more limited production than upstream HUC5s	Medium
	Middle Fork Willamette	Fall Creek	1709000109	3	1	1	1	2	8	Moderate HUC5 score; PCEs support a TRT core population; CHART concluded that this and other uppermost watersheds likely have highest value in this subbasin	High
	Middle Fork Willamette	Lower Middle Fork of Willamette River	1709000110	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core population but are more degraded in this lowermost HUC5; high value connectivity reaches for upstream HUC5s	Medium
	Coast Fork Willamette	Row River	1709000201	2	1	0	0	2	5	Not identified as supporting a demographically independent population; limited habitat/distribution	Low
	Coast Fork Willamette	Mosby Creek	1709000202	3	1	0	0	2	6	Not identified as supporting a demographically independent population; limited habitat/distribution	Low

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Coast Fork Willamette	Upper Coast Fork Willamette River	1709000203	3	1	0	0	1	5	Not identified as supporting a demographically independent population; limited habitat/distribution	Low
	Coast Fork Willamette	Lower Coast Fork Willamette River	1709000205	3	1	0	0	2	6	Not identified as supporting a demographically independent population; limited habitat/distribution	Low
	Upper Willamette	Long Tom River	1709000301	1	1	1	0	1	4	Low HUC5 score; not identified as supporting a demographically independent population; very limited PCEs	Low
	Upper Willamette	Muddy Creek	1709000302	3	1	0	1	3	8	Moderate HUC5 score; CHART concluded that tributaries are low value relative to other HUC5s, but rearing/migration PCEs in Willamette corridor are highly essential for upstream HUC5s/populations	Low
	Upper Willamette	Calapooia River	1709000303	3	1	0	1	3	8	Moderate HUC5 score; HUC5 contains all spawning PCEs for a demographically independent population	Medium
	Upper Willamette	Oak Creek	1709000304	3	1	0	1	3	8	Moderate HUC5 score; CHART concluded that tributaries are low value relative to other HUC5s, but rearing/migration PCEs in Willamette corridor are highly essential for upstream HUC5s/populations	Low
	Upper Willamette	Marys River	1709000305	1	1	1	0	1	4	Low HUC5 score; not identified as supporting a demographically independent population; limited PCEs, however CHART concluded (based on recent information from ODFW) that this watershed may be important for rearing chinook	Medium



Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Upper Willamette	Luckiamute River	1709000306	1	1	1	0	1	4	Low HUC5 score; not identified as supporting a demographically independent population; limited PCEs, however CHART concluded (based on recent information from ODFW) that this watershed may be important for rearing chinook	Medium
	Mckenzie	Upper Mckenzie River	1709000401	3	3	3	2	2	13	High HUC5 score; PCEs support a TRT core and legacy population; ODFW considers McKenzie River as essential habitat for spring chinook; PCEs are in a FEMAT key watershed	High
	Mckenzie	Horse Creek	1709000402	2	3	3	2	2	12	High HUC5 score; PCEs support a TRT core and legacy population; ODFW considers McKenzie River as essential habitat for spring chinook; PCEs are in a FEMAT key watershed	High
	Mckenzie	South Fork Mckenzie River	1709000403	2	3	3	2	2	12	High HUC5 score; PCEs support a TRT core and legacy population; ODFW considers McKenzie River as essential habitat for spring chinook; PCEs are in a FEMAT key watershed	High
	Mckenzie	Blue River	1709000404	1	2	1	1	2	7	Low- moderate HUC5 score; PCEs support a TRT core and legacy population; ODFW considers McKenzie River as essential habitat for spring chinook; however very limited PCEs and dam-related impacts reduce the value of this HUC5	Medium

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Mckenzie	Mckenzie River/Quartz Creek	1709000405	3	3	3	3	2	14	High HUC5 score; PCEs support a TRT core and legacy population; ODFW considers McKenzie River as essential habitat for spring chinook; high value connectivity reaches for upstream HUC5s	High
	Mckenzie	Mohawk River	1709000406	3	1	1	1	2	8	Moderate HUC5 score; PCEs support a TRT core and legacy population; ODFW considers McKenzie River as essential habitat for spring chinook; lower quality PCEs in this HUC5 relative to upstream HUC5s	Medium
	Mckenzie	Lower Mckenzie River	1709000407	3	2	3	3	2	13	High HUC5 score; PCEs support a TRT core and legacy population; ODFW considers McKenzie River as essential habitat for spring chinook; mixed PCE conditions due to dam impacts; high value connectivity reaches for upstream HUC5s; some PCEs in a FEMAT key watershed	High
	North Santiam	Upper North Santiam River	1709000501						*	<u>Unoccupied HUC5</u> , but population expansion into this HUC5 possibly essential for conservation; High HUC5 score	Possibly High
	North Santiam	North Fork Breitenbush River	1709000502						*	<u>Unoccupied HUC5</u> , but population expansion into this HUC5 possibly essential for conservation; High HUC5 score	Possibly High
	North Santiam	Detroit Reservoir/Blowout Divide Creek	1709000503						*	<u>Unoccupied HUC5</u> , but population expansion into this HUC5 possibly essential for conservation; moderate HUC5 score (lower than others in this portion of the subbasin due to inundated habitat)	Possibly Medium

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	North Santiam	Middle North Santiam River	1709000504	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core population and ODFW considers North Santiam as essential habitat for spring chinook; CHART emphasized importance of expanding population into habitats upstream of this HUC5	High
	North Santiam	Little North Santiam River	1709000505	3	1	3	2	2	11	High HUC5 score; PCEs support a TRT core population and ODFW considers North Santiam as essential habitat for spring chinook; PCEs are in a FEMAT key watershed	High
	North Santiam	Lower North Santiam River	1709000506	3	1	1	2	3	10	Moderate HUC5 score; PCEs support a TRT core population and ODFW considers North Santiam as essential habitat for spring chinook; spawning PCEs in other upstream HUC5s in this subbasin are likely of higher conservation value; high value connectivity reaches for upstream HUC5s	Medium
	South Santiam	Hamilton Creek/South Santiam River	1709000601	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT demographically independent population; recent high density of redds may be indicative of high production potential; high value connectivity reaches for all HUC5s in this subbasin	High
	South Santiam	Crabtree Creek	1709000602	3	1	0	1	2	7	Low-moderate HUC5 score; PCEs support a TRT demographically independent population; PCEs are likely of lower quality than other HUC5s in subbasin	Medium

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	South Santiam	Thomas Creek	1709000603	3	1	0	1	2	7	Low-moderate HUC5 score; PCEs support a TRT demographically independent population; PCEs are likely of lower quality than other HUC5s in subbasin	Medium
	South Santiam	Quartzville Creek	1709000604						**	<u>Unoccupied HUC5</u> , but population expansion into this HUC5 possibly essential for conservation; Green Peter Dam is a barrier to fish distribution in this watershed; High HUC5 score	Possibly High
	South Santiam	Middle Santiam River	1709000605						**	<u>Unoccupied HUC5</u> , but population expansion into this HUC5 possibly essential for conservation; Green Peter Dam is a barrier to fish distribution in this watershed; High HUC5 score	Possibly High
	South Santiam	South Santiam River	1709000606	3	2	1	2	2	10	Moderate HUC5 score; PCEs support a TRT demographically independent population; PCEs are likely some of the best for this population despite inundated habitat	High
	South Santiam	South Santiam River / Foster Reservoir	1709000607	3	2	1	2	2	10	Moderate HUC5 score; PCEs support a TRT demographically independent population; PCEs likely some of the best for this population despite inundated habitat; high value connectivity reaches for upstream HUC5	High

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	South Santiam	Wiley Creek	1709000608	2	1	1	1	2	7	Low-moderate HUC5 score; PCEs support a TRT demographically independent population; recent high density of redds may be indicative of high production potential but PCEs in this HUC5 are more limited and likely of lower quality than other HUC5s in subbasin	Medium
	Middle Willamette	Mill Creek/Willamette River	1709000701	1	1	1	0	2	5	Low HUC5 score; PCEs support one TRT population; rearing/migration PCEs in tributaries probably not as important as those for high value connectivity reaches for upstream HUC5s (North Santiam subbasin)	Low
	Middle Willamette	Rickreall Creek	1709000702	3	1	0	1	3	8	Moderate HUC5 score; PCEs in Willamette corridor are highly essential and support several TRT populations but no spawning PCEs in this HUC5 and CHART concluded that rearing/migration PCEs in westside tributaries are low value	Low
	Middle Willamette	Willamette River/Chehalem Creek	1709000703	3	1	1	1	3	8	Moderate HUC5 score; no spawning PCEs in HUC5 and CHART concluded that tributaries are low value, but the Willamette corridor is highly essential	Low
	Middle Willamette	Abernethy Creek	1709000704	2	1	1	1	3	7	Low-moderate HUC5 score; no spawning PCEs in HUC5 and CHART concluded that tributaries are low value, but the Willamette corridor is highly essential	Low
	Yamhill	Lower South Yamhill River	1709000804	1	1	1	1	1	5	Not identified as supporting a demographically independent population; no spawning in westside HUC5s and very limited rearing PCEs	Low

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Yamhill	Salt Creek/South Yamhill River	1709000805	1	1	1	1	1	5	Not identified as supporting a demographically independent population; no spawning in westside HUC5s and very limited rearing PCEs	Low
	Yamhill	North Yamhill River	1709000806	1	1	1	1	1	5	Not identified as supporting a demographically independent population; no spawning in westside HUC5s and very limited rearing PCEs	Low
	Yamhill	Yamhill River	1709000807	3	1	1	1	1	7	Not identified as supporting a demographically independent population; no spawning in westside HUC5s; reaches near confluence with Willamette may provide important rearing for eastside populations upstream	Low
	Molalla/Pudding	Abiqua Creek/Pudding River	1709000901	3	1	0	1	2	7	Moderate HUC5 score; PCEs support a TRT demographically independent population but subbasin has relatively low abundance and distribution objectives identified by ODFW; PCE quality relatively low. CHART elevated this HUC5 from a Low to Medium coconservation value, noting that recent data from a watershed assessment indicate that this HUC5 has some of the highest-quality habitat in the Pudding River subbasin.	Medium
	Molalla/Pudding	Butte Creek/Pudding River	1709000902	3	1	0	1	2	7	Low-moderate HUC5 score; PCEs support a TRT demographically independent population but subbasin has relatively low abundance and distribution objectives identified by ODFW; PCE quality relatively low	Low

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Molalla/Pudding	Rock Creek/Pudding River	1709000903	3	1	0	1	2	7	Low-moderate HUC5 score; PCEs support a TRT demographically independent population but subbasin has relatively low abundance and distribution objectives identified by ODFW; PCE quality relatively low	Low
	Molalla/Pudding	Senecal Creek/Mill Creek	1709000904	3	1	0	1	2	7	Low-moderate HUC5 score; PCEs support a TRT demographically independent population but subbasin has relatively low abundance and distribution objectives identified by ODFW; PCE quality relatively low	Low
	Molalla/Pudding	Upper Molalla River	1709000905	3	1	1	1	2	8	Moderate HUC5 score; PCEs support a TRT demographically independent population but subbasin has relatively low abundance and distribution objectives identified by ODFW; most of spawning PCEs for this population probably in this HUC5 although of relatively low quality	Medium
	Molalla/Pudding	Lower Molalla River	1709000906	3	1	1	1	2	8	Moderate HUC5 score; PCEs support a TRT demographically independent population but subbasin has relatively low abundance and distribution objectives identified by ODFW; PCE quality relatively low yet important connectivity reaches for the upstream HUC5	Medium
	Clackamas	Collawash River	1709001101	3	2	3	2	2	12	High HUC5 score; PCEs support a TRT core population and the only population downstream of Willamette Falls; ODFW considers Clackamas as essential habitat for spring chinook; PCEs are in a FEMAT key watershed and HUC5 is one of few remaining high elevation/gradient areas for ESU	High

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Clackamas	Upper Clackamas River	1709001102	3	2	3	2	2	12	High HUC5 score; PCEs support a TRT core population and the only population downstream of Willamette Falls; ODFW considers Clackamas as essential habitat for spring chinook; PCEs are in a FEMAT key watershed and HUC5 is one of few remaining high elevation/gradient areas for ESU	High
	Clackamas	Oak Grove Fork Clackamas River	1709001103	3	2	3	1	2	11	High HUC5 score; PCEs support a TRT core population and the only population downstream of Willamette Falls; ODFW considers Clackamas as essential habitat for spring chinook; PCEs are in a FEMAT key watershed; PCEs very limited here but HUC5 is one of few remaining high elevation/gradient areas for ESU	High
	Clackamas	Middle Clackamas River	1709001104	3	2	3	2	2	12	High HUC5 score; PCEs support a TRT core population and the only population downstream of Willamette Falls; ODFW considers Clackamas as essential habitat for spring chinook; PCEs are in a FEMAT key watershed	High
	Clackamas	Eagle Creek	1709001105	3	2	0	0	0	5	Low HUC5 score; PCEs support a TRT core population and the only population downstream of Willamette Falls; ODFW considers Clackamas as essential habitat for spring chinook, but CHART noted very limited production in this HUC5	Low



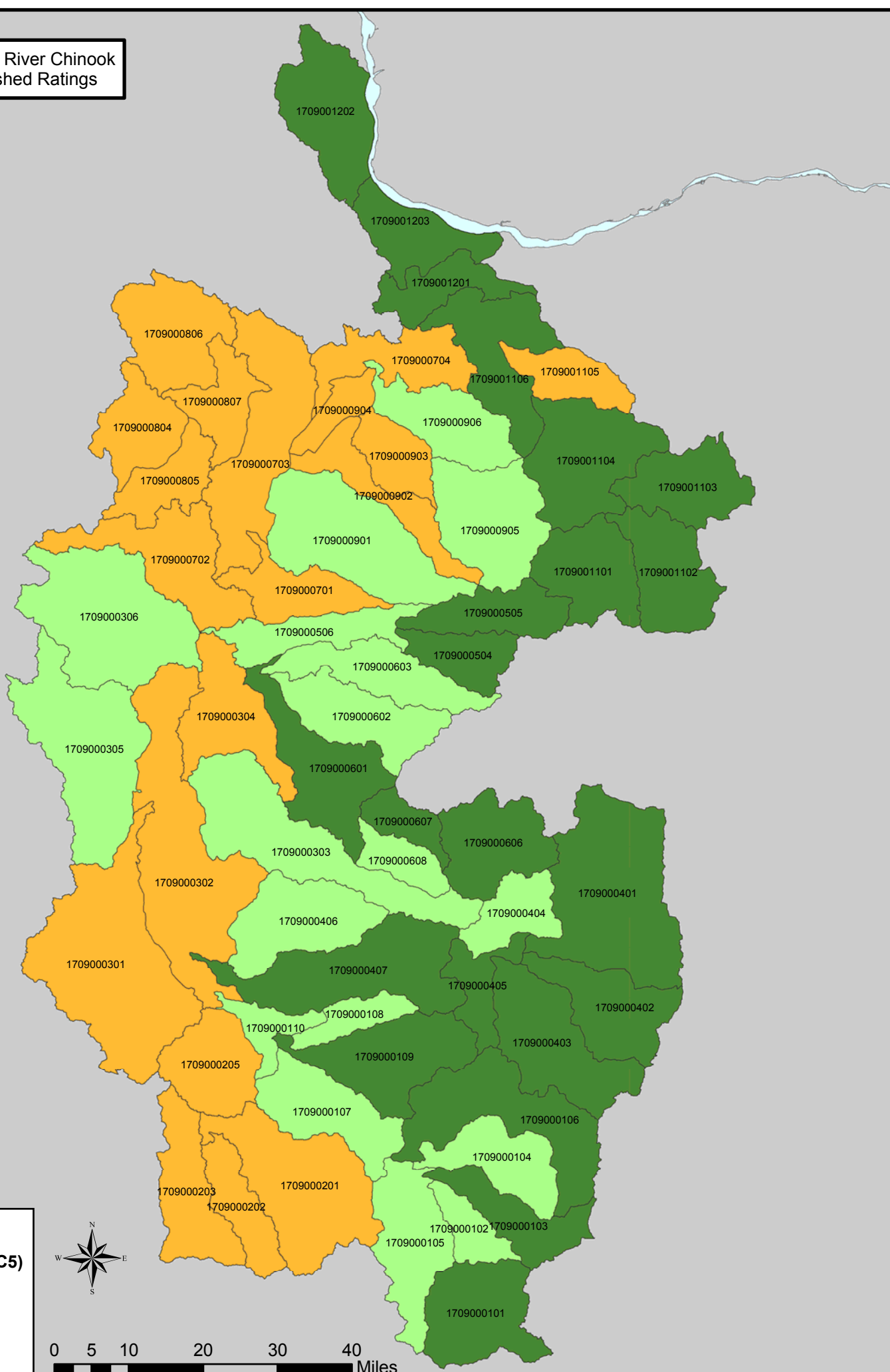
Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					6Total HUC5 Score (0-15) <sup>1</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Clackamas	Lower Clackamas River	1709001106	3	1	3	2	2	11	High HUC5 score; PCEs support a TRT core population and the only population downstream of Willamette Falls; ODFW considers Clackamas as essential habitat for spring chinook; PCEs in HUC5 likely lowest quality in subbasin but HUC5 has high value connectivity reaches for upstream HUC5s	High
	Lower Willamette	Johnson Creek	1709001201						NS	HUC5 not scored since it is part of the migration corridor. The CHART concluded that rearing and migration PCEs throughout this corridor are highly essential to ESU conservation.	High
	Lower Willamette	Scappoose Creek	1709001202						NS	HUC5 not scored since it is part of the migration corridor. The CHART concluded that rearing and migration PCEs throughout this corridor are highly essential to ESU conservation.	High
	Lower Willamette	Columbia Slough/Willamette River	1709001203						NS	HUC5 not scored since it is part of the migration corridor. The CHART concluded that rearing and migration PCEs throughout this corridor are highly essential to ESU conservation.	High
	Multiple	Columbia River Corridor (Willamette to Ocean)	NA						NS	Area not scored since many reaches are outside HUC5 boundaries. However, the CHART concluded that rearing and migration PCEs throughout this corridor are highly essential to ESU conservation	High

\* Scored by CHART although HUC5 is currently blocked and occupied (via trap and haul) only by non-listed hatchery chinook salmon.

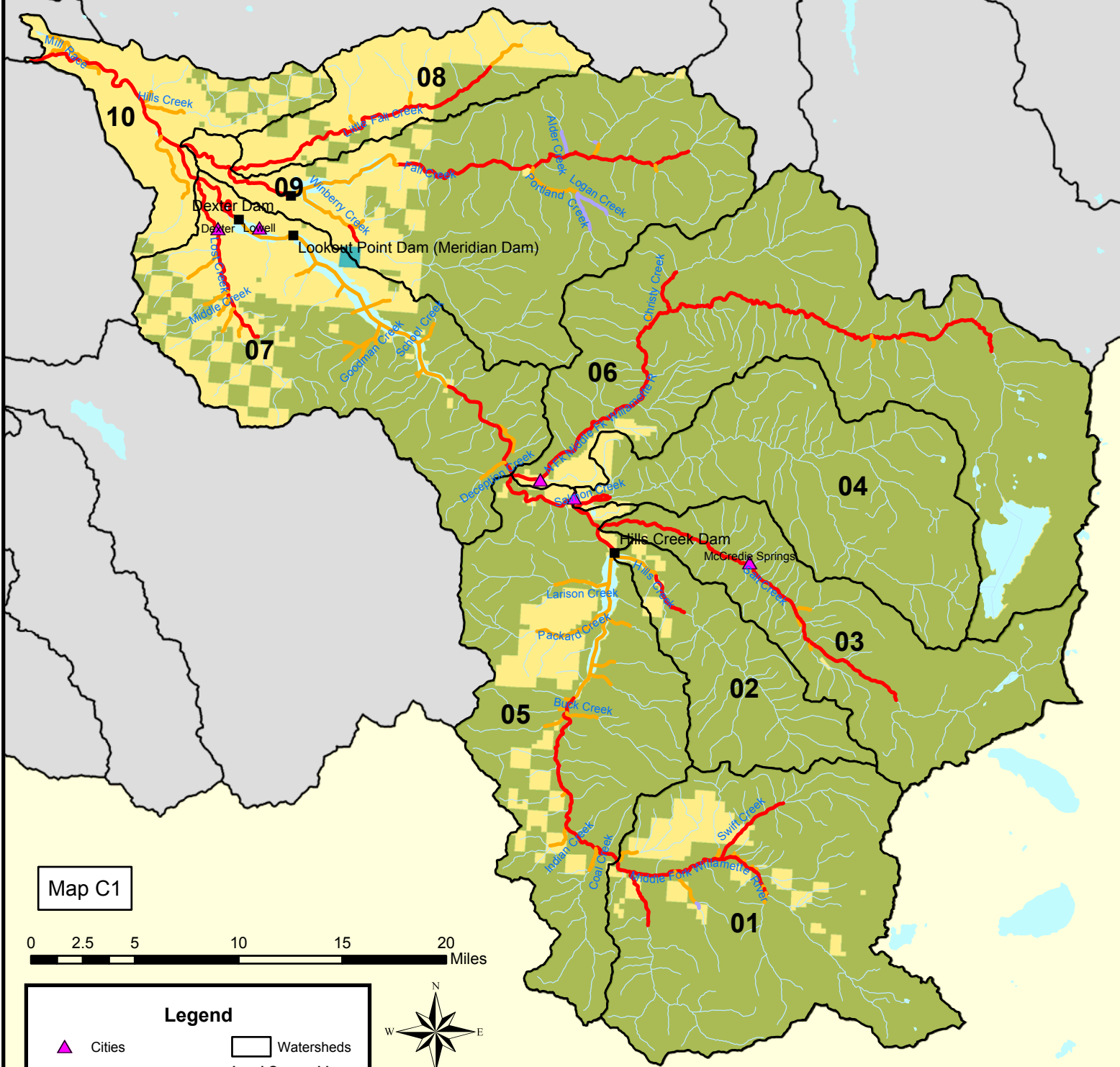
\*\* Rated by CHART although HUC5 is currently blocked and unoccupied.

**Figure C1.** CHART Ratings of Conservation Value for Habitat Areas in HUC5 Watersheds Occupied by the Upper Willamette River Chinook Salmon ESU

Upper Willamette River Chinook  
CHART Watershed Ratings



# Upper Willamette Spring Chinook Distribution Middle Fork Willamette Sub-basin (17090001)



Map C1

0 2.5 5 10 15 20 Miles

## Legend

- |                                    |             |               |
|------------------------------------|-------------|---------------|
| Cities                             | Dams        | Watersheds    |
| Lakes                              | Federal     | Private/Other |
| Streams (1:100,000)                | State/Local | Tribal        |
| <b>Spring Chinook Distribution</b> | Unassigned  | Water         |
| Spawning/Rearing                   |             |               |
| Rearing/Migration                  |             |               |
| Migration/Presence                 |             |               |



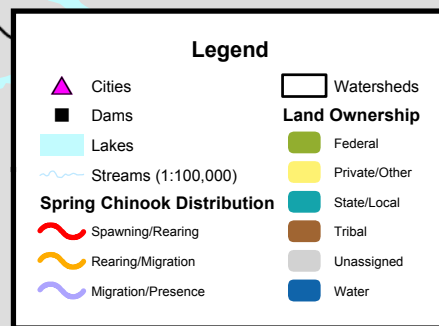
Watershed code = last two digits of sub-basin code

Note: This map is for general reference only

# Upper Willamette Spring Chinook Distribution Coast Fork Willamette Sub-basin (17090002)



Map C2



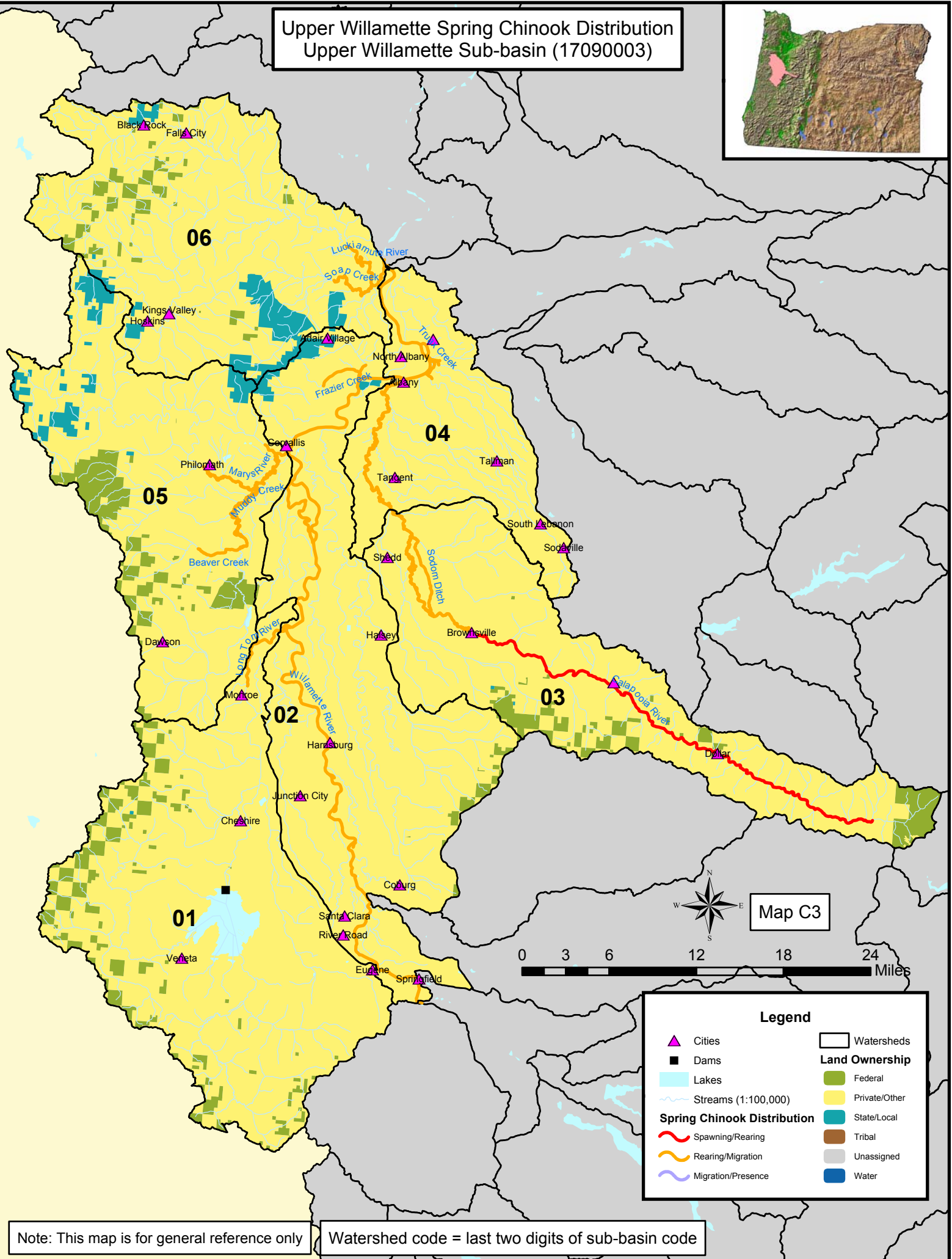
0 1.5 3 6 9 12 Miles

Watershed code = last two digits of sub-basin code

Note: This map is for general reference only



# Upper Willamette Spring Chinook Distribution Upper Willamette Sub-basin (17090003)



Map C3

0 3 6 12 18 24 Miles

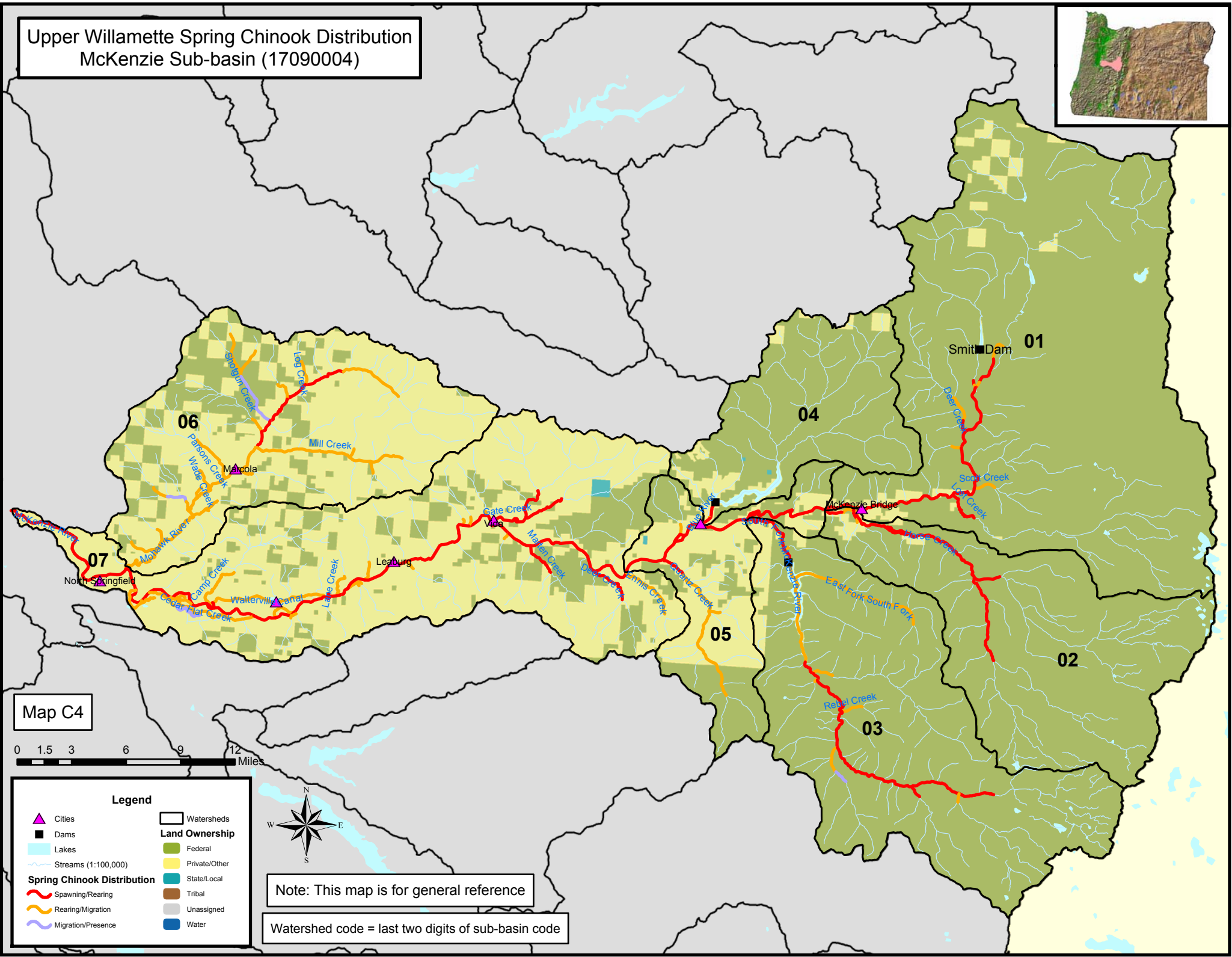
**Legend**

- Cities
- Dams
- Lakes
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Land Ownership**
  - Federal
  - Private/Other
  - State/Local
  - Tribal
  - Unassigned
  - Water

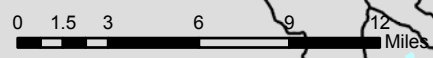
Note: This map is for general reference only

Watershed code = last two digits of sub-basin code

# Upper Willamette Spring Chinook Distribution McKenzie Sub-basin (17090004)



Map C4



**Legend**

- Cities
- Dams
- Lakes
- Streams (1:100,000)
- Spring Chinook Distribution**
  - Spawning/Rearing
  - Rearing/Migration
  - Migration/Presence

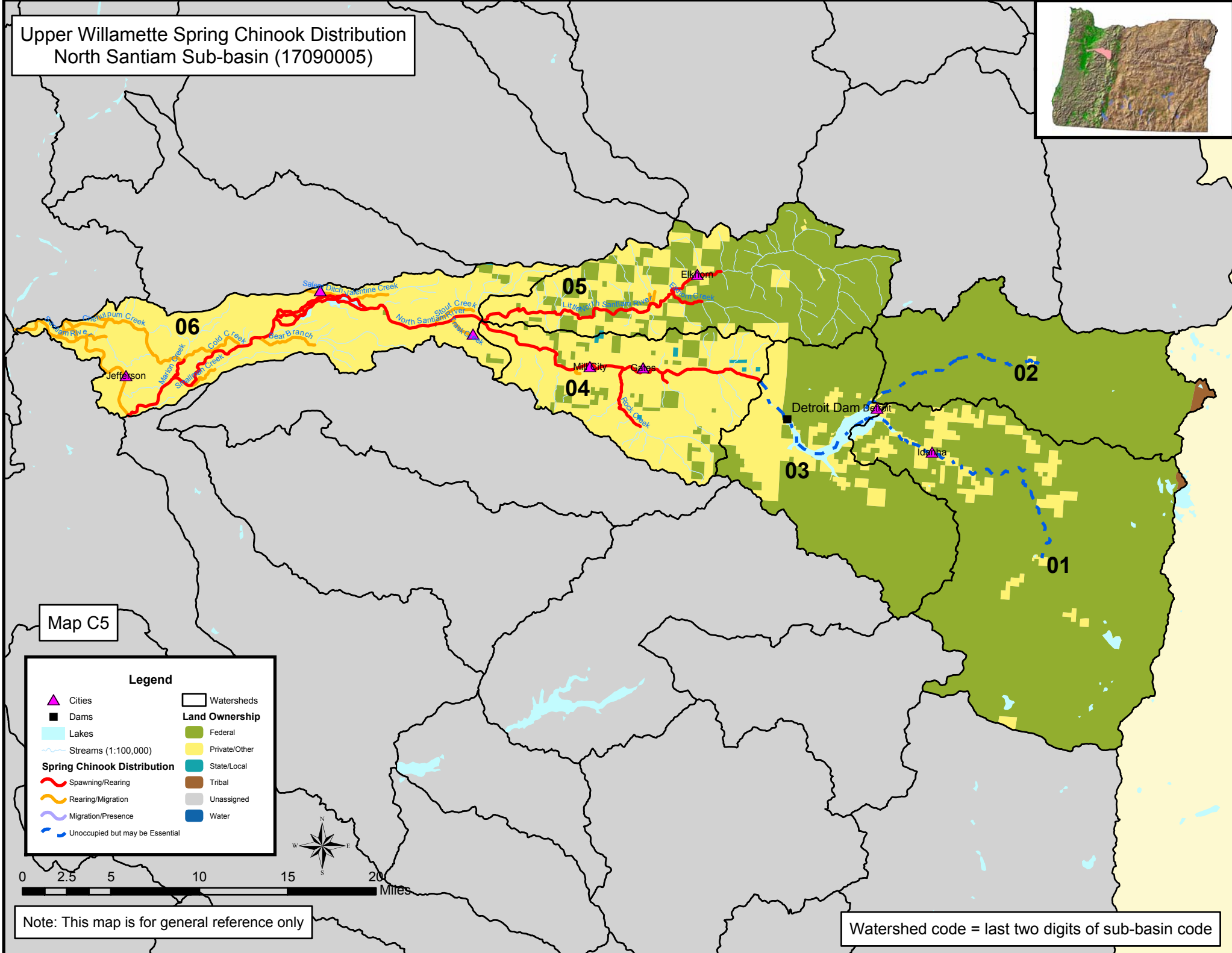
**Land Ownership**

- Federal
- Private/Other
- State/Local
- Tribal
- Unassigned
- Water



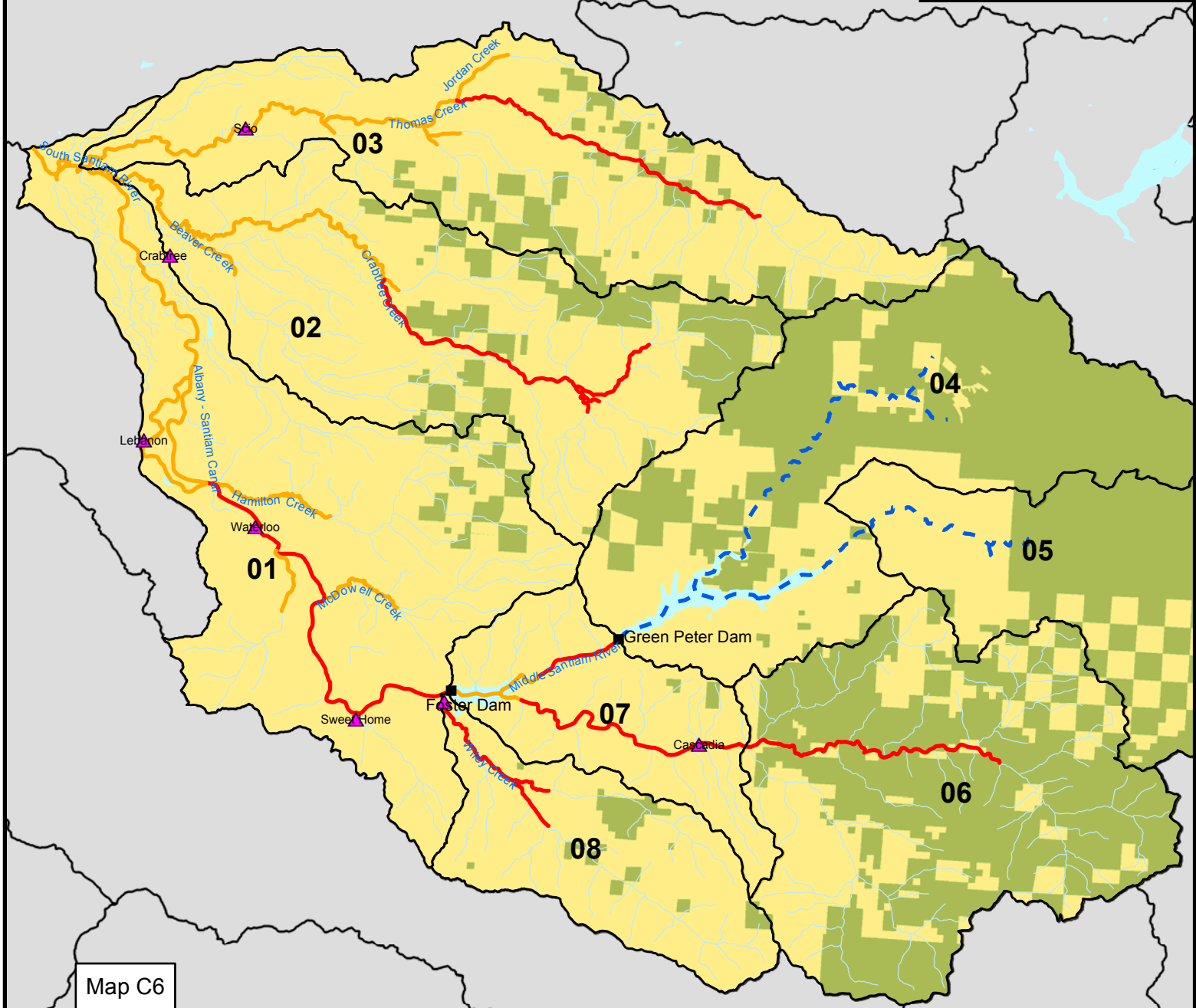
Note: This map is for general reference

Watershed code = last two digits of sub-basin code





# Upper Willamette Spring Chinook Distribution South Santiam Sub-basin (17090006)



Map C6

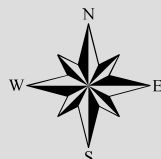
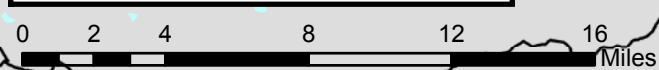
**Legend**

- Cities
- Dams
- Lakes
- Streams (1:100,000)
- Spring Chinook Distribution**
  - Spawning/Rearing
  - Rearing/Migration
  - Migration/Presence
  - Unoccupied but may be Essential

**Land Ownership**

- Federal
- Private/Other
- State/Local
- Tribal
- Unassigned
- Water

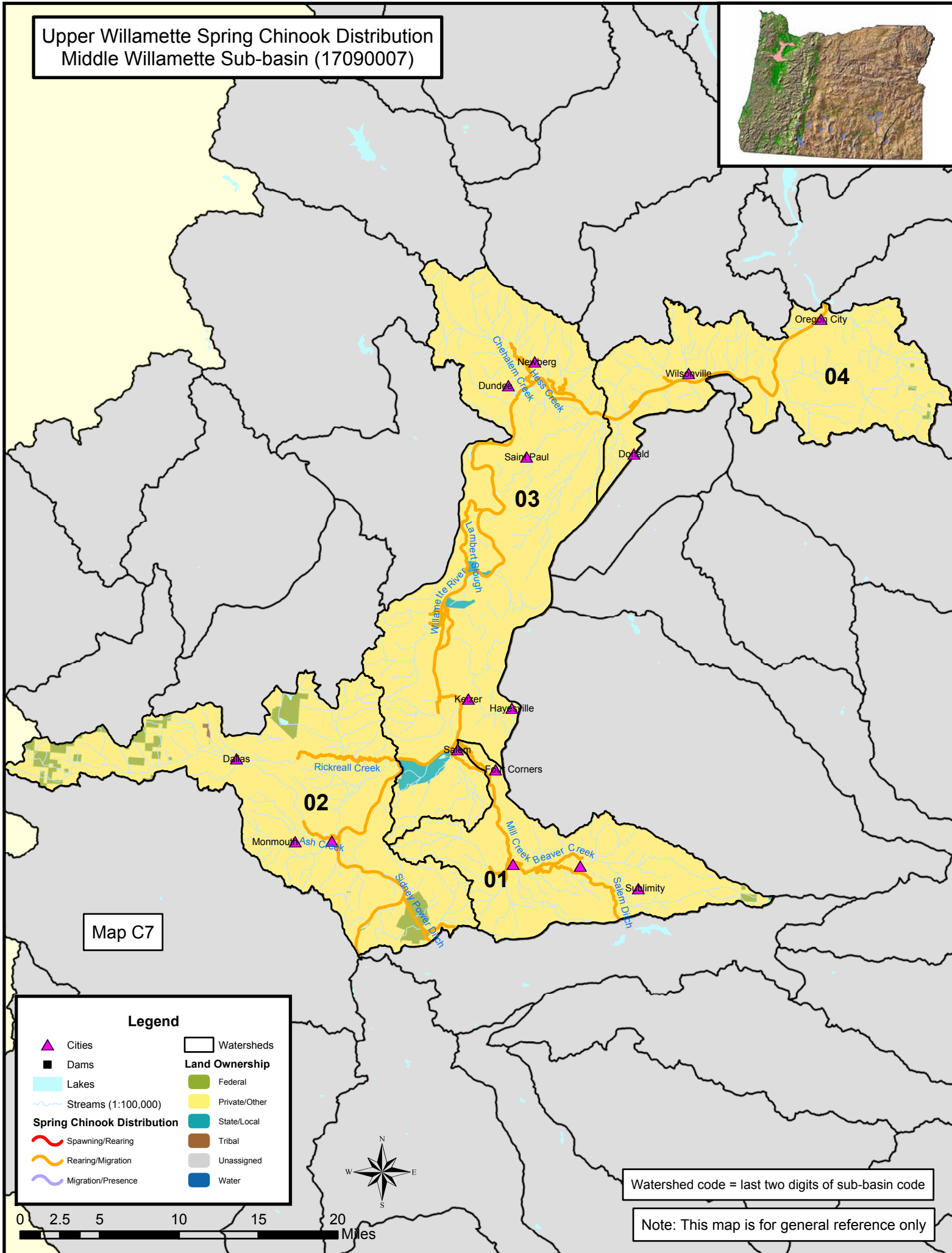
Watersheds



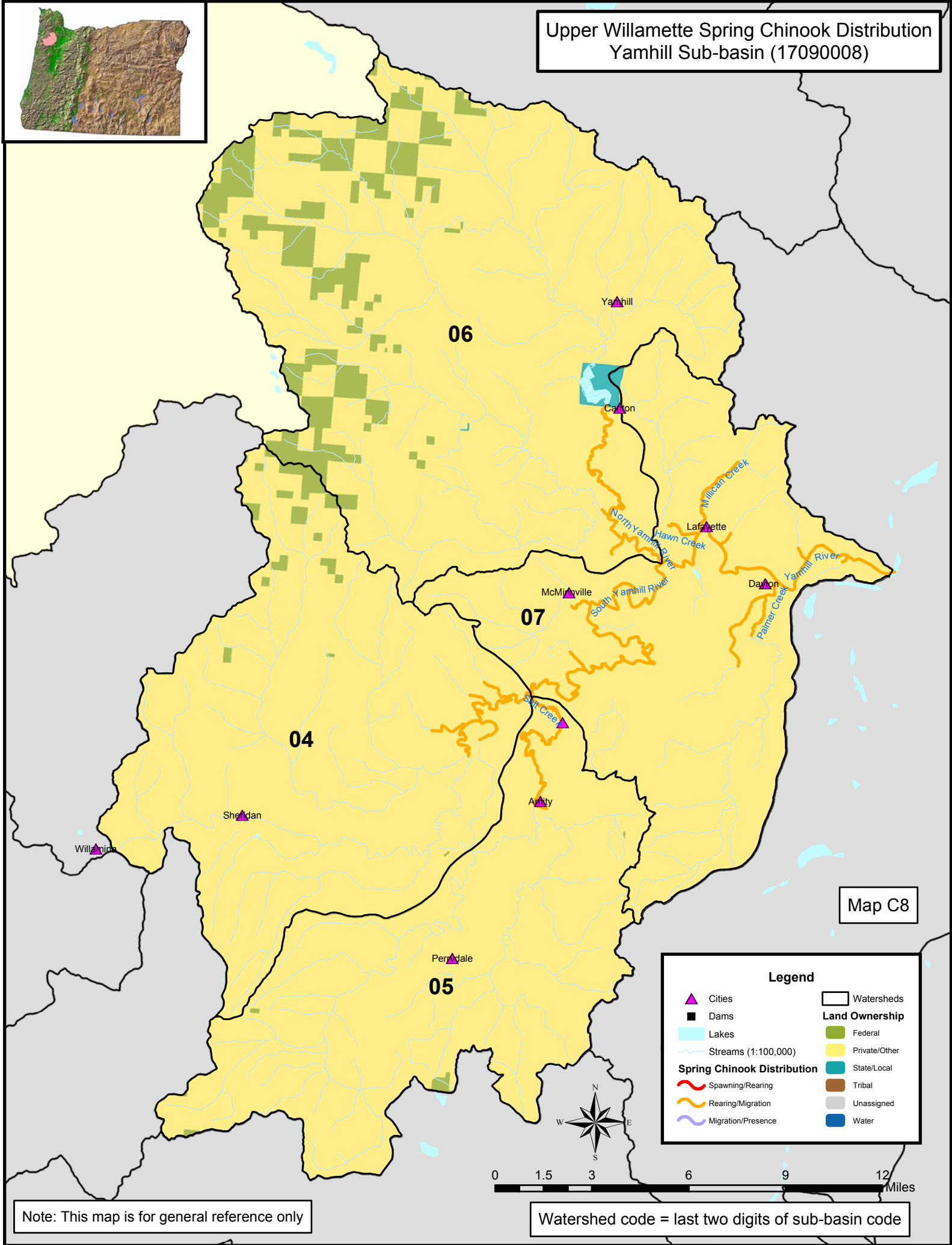
Watershed code = last two digits of sub-basin code

Note: This map is for general reference only

Upper Willamette Spring Chinook Distribution  
Middle Willamette Sub-basin (17090007)



# Upper Willamette Spring Chinook Distribution Yamhill Sub-basin (17090008)



Map C8

**Legend**

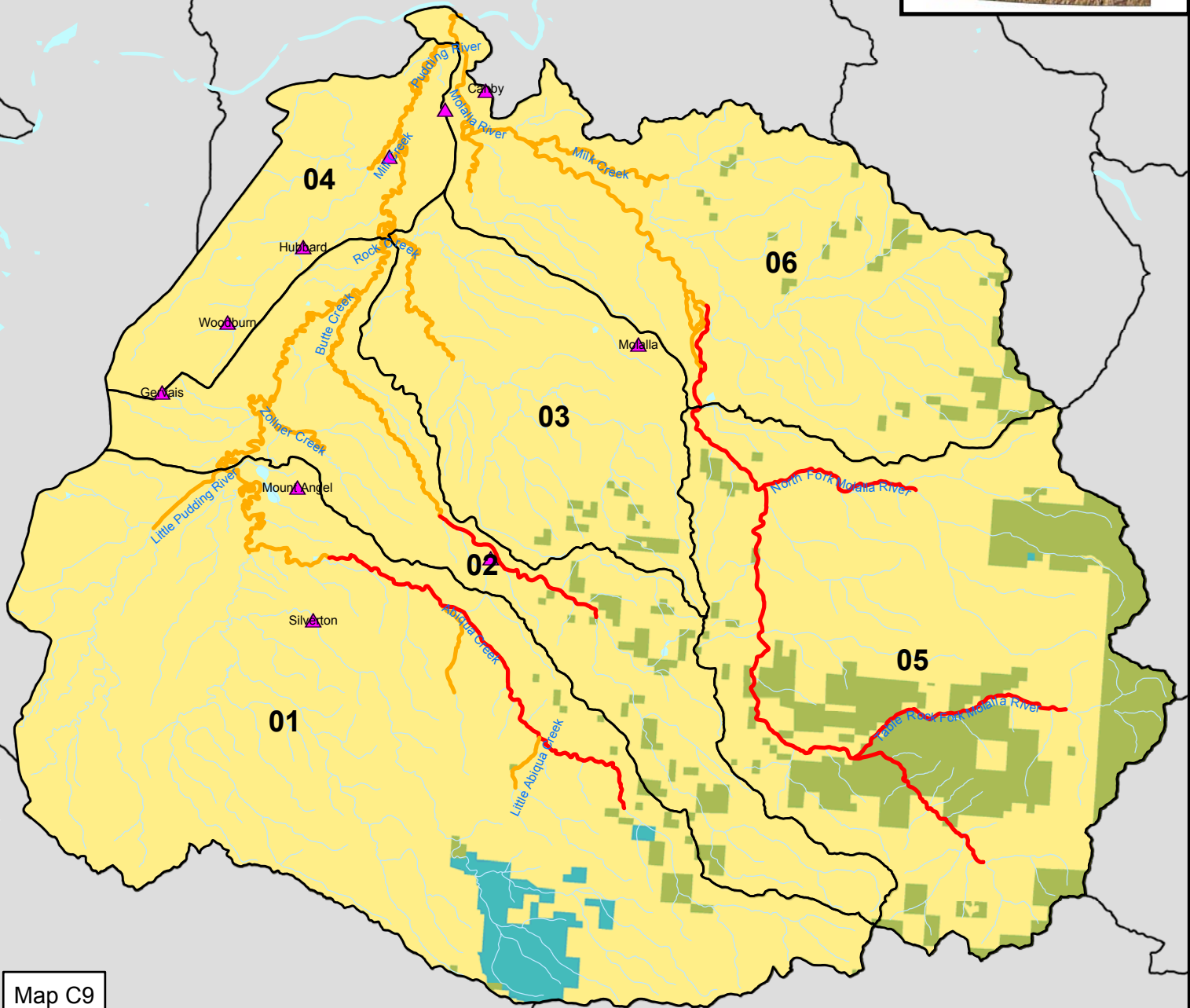
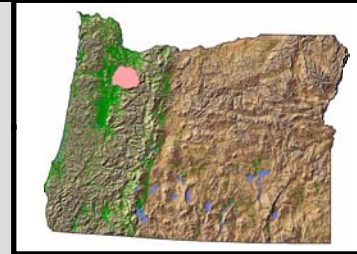
Cities	Dams	Lakes	Streams (1:100,000)
<b>Spring Chinook Distribution</b>			
Spawning/Rearing	Rearing/Migration	Migration/Presence	
<b>Land Ownership</b>			
Federal	Private/Other	State/Local	Tribal
Unassigned	Water		

Note: This map is for general reference only

Watershed code = last two digits of sub-basin code



# Upper Willamette Spring Chinook Distribution Molalla/Pudding Sub-basin (17090009)



Map C9

## Legend

- |                                    |                       |
|------------------------------------|-----------------------|
| Cities                             | Watersheds            |
| Dams                               | <b>Land Ownership</b> |
| Lakes                              | Federal               |
| Streams (1:100,000)                | Private/Other         |
| <b>Spring Chinook Distribution</b> | State/Local           |
| Spawning/Rearing                   | Tribal                |
| Rearing/Migration                  | Unassigned            |
| Migration/Presence                 | Water                 |

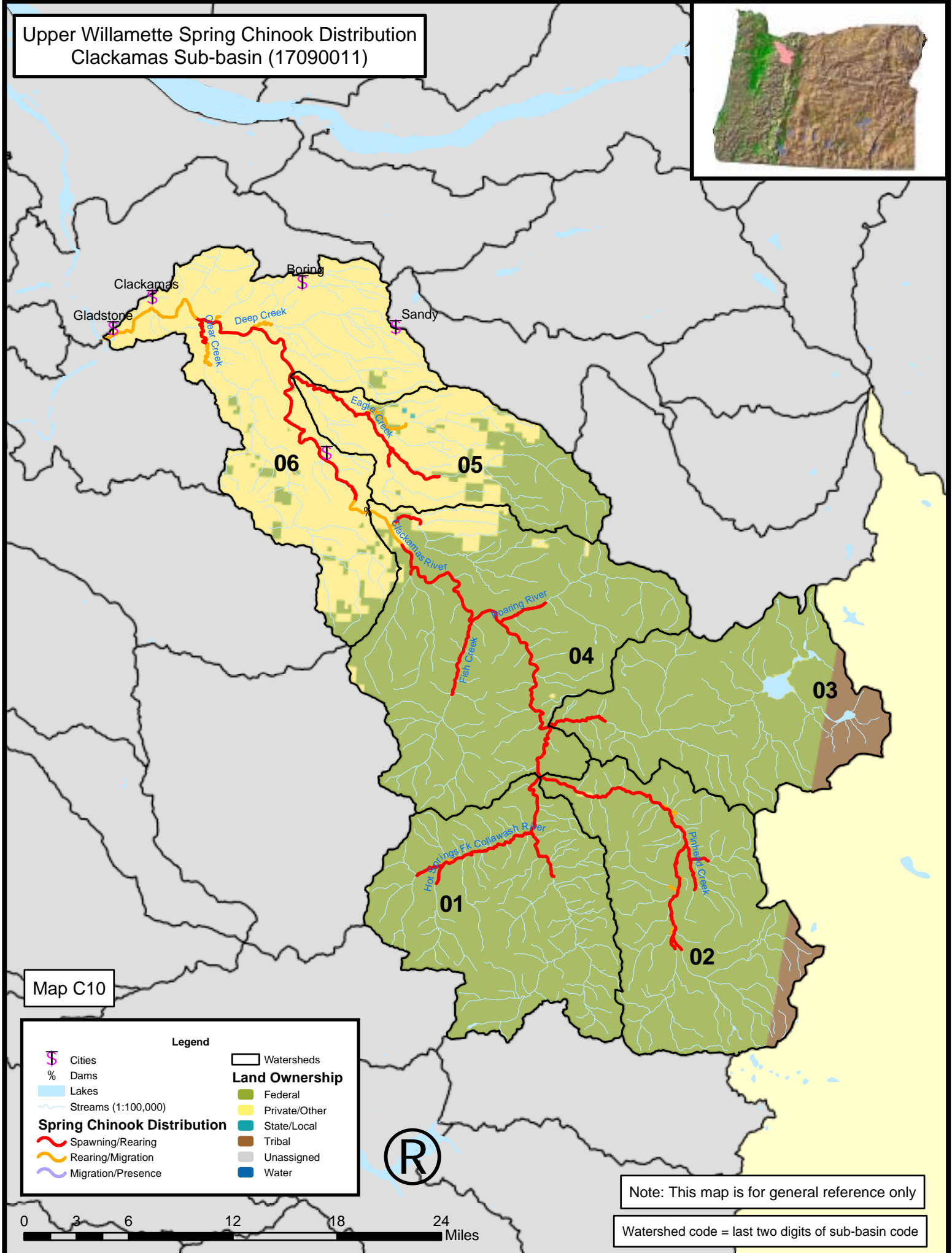


Watershed code = last two digits of sub-basin code

Note: This map is for general reference only

0 1.5 3 6 9 12 Miles

# Upper Willamette Spring Chinook Distribution Clackamas Sub-basin (17090011)



Map C10

## Legend

- Cities
- Dams
- Lakes
- Streams (1:100,000)

## Spring Chinook Distribution

- Spawning/Rearing
- Rearing/Migration
- Migration/Presence

## Land Ownership

- Federal
- Private/Other
- State/Local
- Tribal
- Unassigned
- Water

Note: This map is for general reference only

Watershed code = last two digits of sub-basin code